

What is claimed is:

1. A fragile nutrient cochleate formulation comprising:
a fragile nutrient component; and
5 a cochleate comprising a negatively charged lipid component and a multivalent cation component.
2. The formulation of claim 1, comprising at least 1% fragile nutrient component by weight.
- 10 3. The formulation of claim 1, comprising at least 3% fragile nutrient component by weight.
4. The formulation of claim 1, comprising at least 5% fragile nutrient component by weight.
- 15 5. The formulation of claim 1, wherein the fragile nutrient component is substantially incorporated into the cochleate structure.
- 20 6. The formulation of claim 1, wherein the negatively charged lipid component comprises phosphatidylserine.
7. The formulation of claim 1, wherein the negatively charged lipid component comprises a soy phosphatidylserine.
- 25 8. The formulation of claim 1, wherein the fragile nutrient is a phytochemical.
9. The formulation of claim 1, wherein the fragile nutrient is an antioxidant phytochemical.
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10. The formulation of claim 1, wherein the fragile nutrient is at least one phytochemical selected from the group consisting of: beta-carotene, lutein, zeaxanthine, quercetin, silibin, perillyl alcohol, genistein, sulfurophane and lycopene.
- 5 11. The formulation of claim 1, wherein the fragile nutrient is a zoochemical.
12. The formulation of claim 1, wherein the fragile nutrient is at least one zoochemical selected from the group consisting of: omega-3 and omega-6 fatty acids.
- 10 13. The formulation of claim 1, further comprising one or more additional cargo moiety.
14. The formulation of claim 1, comprising at least one additional cargo moiety selected from the group consisting of: a vitamin, a mineral, a nutrient, a micronutrient, an amino acid, a toxin, a microbicide, a microbistat, a co-factor, an enzyme, a
- 15 polypeptide, a polypeptide aggregate, a polynucleotide, a lipid, a carbohydrate, a nucleotide, a starch, a pigment, a fatty acid, a monounsaturated fatty acid, a polyunsaturated fatty acid, a flavor substance, a flavored essential oil or extract, a hormone, a cytokine, a virus, an organelle, a steroid or other multi-ring structure, a saccharide, a metal, a metabolic poison, an antigen, an imaging agent, a porphyrin, a
- 20 tetrapyrrolic pigment, and a drug.
15. The formulation of claim 1, wherein the fragile nutrient component is beta-carotene and the formulation further comprises a vitamin E component.
- 25 16. A pharmaceutical composition comprising a fragile nutrient cochleate formulation of any of claims 1-15 and a pharmaceutically acceptable carrier.
17. A food item comprising the fragile nutrient cochleate formulation of any of claims 1-15.
- 30 18. The food item of claim 17, wherein the food item is selected from the group consisting of: health bars, snack foods, domesticated animal foods, fish foods, poultry feeds, dog foods, cat foods, animal foods, and health drinks.

19. A personal care product comprising the fragile nutrient cochleate formulation of any of claims 1-15.
- 5 20. The personal care product of claim 19, wherein the personal care product is a hair care product or a skin care product.
21. A method of making a fragile nutrient cochleate formulation, the method comprising the steps of:
- 10 dissolving a negatively-charged lipid component and a fragile nutrient component in an organic solvent to form a solution;
 forming fragile nutrient liposomes from the solution; and
 exposing the fragile nutrient liposomes to a multivalent cation to form fragile nutrient cochleates.
- 15 22. The method of claim 21, wherein the step of forming the fragile nutrient liposomes includes the addition of salt water to the solution.
23. The method of claim 21, wherein the step of forming the fragile nutrient liposomes
20 includes removal of the solvent from the solution to form a film.
24. The method of claim 21, wherein the solvent comprises a solvent selected from the group consisting of tetrahydrofuran, chloroform, dichloromethane, carbon tetrachloride, butanol, hexane, ethanol, toluene, benzene, ether, petrol ether, oil and
25 combinations thereof.
25. The method of claim 21, further comprising the step of adding the fragile nutrient cochleate to a food item.
- 30 26. The method of claim 25, wherein the food item is selected from the group consisting of: health bars, snack foods, domesticated animal foods, fish foods, poultry feeds, dog foods, cat foods, animal foods, and health drinks.

27. The method of claim 21, further comprising the step of adding the fragile nutrient cochleate to a personal care product.

28. The method of claim 27, wherein the personal care product is a hair care product or a skin care product.

29. A method of delivering fragile nutrients to a subject, the method comprising the step of: administering to a subject a biologically effective amount of fragile nutrient cochleate.

30. The method of claim 29, wherein the fragile nutrient cochleate is delivered in the form of a food item.

31. The method of claim 30, wherein the food item is selected from the group consisting of: a health bar, a snack food, a beverage, a domesticated animal food, a fish food, a poultry feed, a dog food, a cat food, an animal food, and a health drink.

32. The method of claim 29, wherein the fragile nutrient cochleate is delivered in the form of a personal care product.

33. The method of claim 32, wherein the personal care product is a hair care product or a skin care product.

34. The method of claim 29, wherein the administration route is selected from the group consisting of mucosal, systemic, oral, intranasal, intraocular, intrarectal, intravaginal, intrapulmonary, intravenous, intramuscular, subcutaneous, transdermal and intradermal.

35. The method of claim 29, wherein the cochleate comprises an additional fragile nutrient.

36. The method of claim 29, wherein the cochleate comprises at least one additional cargo moiety.

37. The method of claim 36, wherein the at least one additional cargo moiety selected from the group consisting of: a vitamin, a mineral, a nutrient, a micronutrient, an amino acid, a toxin, a microbicide, a microbistat, a co-factor, an enzyme, a polypeptide, a polypeptide aggregate, a polynucleotide, a lipid, a carbohydrate, a nucleotide, a starch, a pigment, a fatty acid, a monounsaturated fatty acid, a polyunsaturated fatty acid, a flavor substance, a flavored essential oil or extract, a hormone, a cytokine, a virus, an organelle, a steroid or other multi-ring structure, a saccharide, a metal, a metabolic poison, an antigen, an imaging agent, a porphyrin, a tetrapyrrolic pigment, and a drug.
38. The method of claim 37, wherein the fragile nutrient cochleate formulation is administered to treat inflammation, pain, infection, fungal infection, bacterial infection, viral infection, parasitic disorders, an immune disorder, genetic disorders, degenerative disorders, cancer, diabetes, insomnia, proliferative disorders, obesity, depression, hair loss, impotence, hypertension, hypotension, dementia, senile dementia, or malnutrition.